HL525B 水平定向钻机

HL525B Horizontal Directional Drill

操作维护手册

SERVICE MANUAL

桂林市华力重工机械有限责任公司

Guilin Huali Heavy Industries Co., Ltd.

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Foreword

Welcome to use the products of our company.

This manual is the guidance for HL525B Horizontal Directional Driller on its operation, inspection, maintenance and its other application.

All the information of this manual is based on the information of the latest product before printing, and the company reserves the rights not to do any notice before of the amendment to the manual content.

Because of the different configuration of the machine, not all of actual configuration the machine you buy can reflect in this manual

Without written permission the contents of this manual may not be copied

This instruction booklet is an essential part of the machine, which shall not be lacked when the machine was resold.

Please keep in touch with distributors or the Guilin Huali Heavy Industrial Co., Ltd. if you come across problems on your booklet or your machine

Security

1. Warning

Warning

Before using the machine, please read and realize this book of operation maintenance guidance and security matters, otherwise don't operate machines. If you don't follow instructions or do not pay attention to the warnings may cause person casualties.

Warning

Before construction you have to do full survey about the condition of the buried underground pipeline you are going to travel through (communication cable, power cable and delivery pipe, etc.), avoid to cause damage to the original underground pipeline and to rig operators.

Warning

When the machine is in operation, maintenance, lubrication and working, only the qualified operation certificate people would be allowed to operate the machine or giving the maintenance and lubrication, and the rest of the irrelevant personnel have to stay away from the machine.

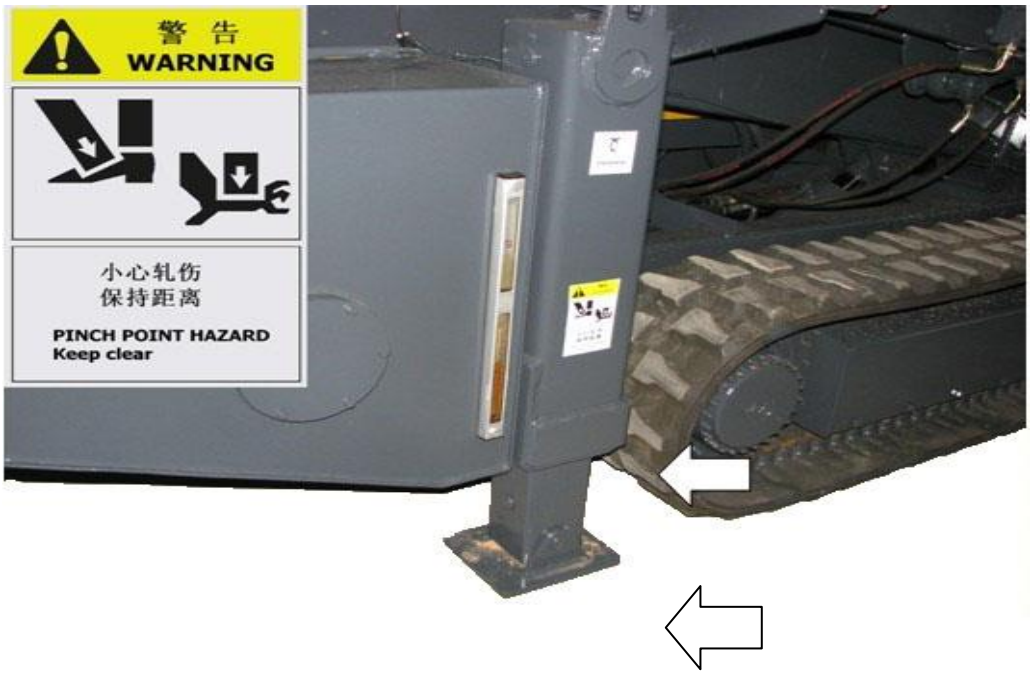
Warning

To ensure safety the lifting of drill pipe anchor or the machine should be under one’s command should have someone to observe.

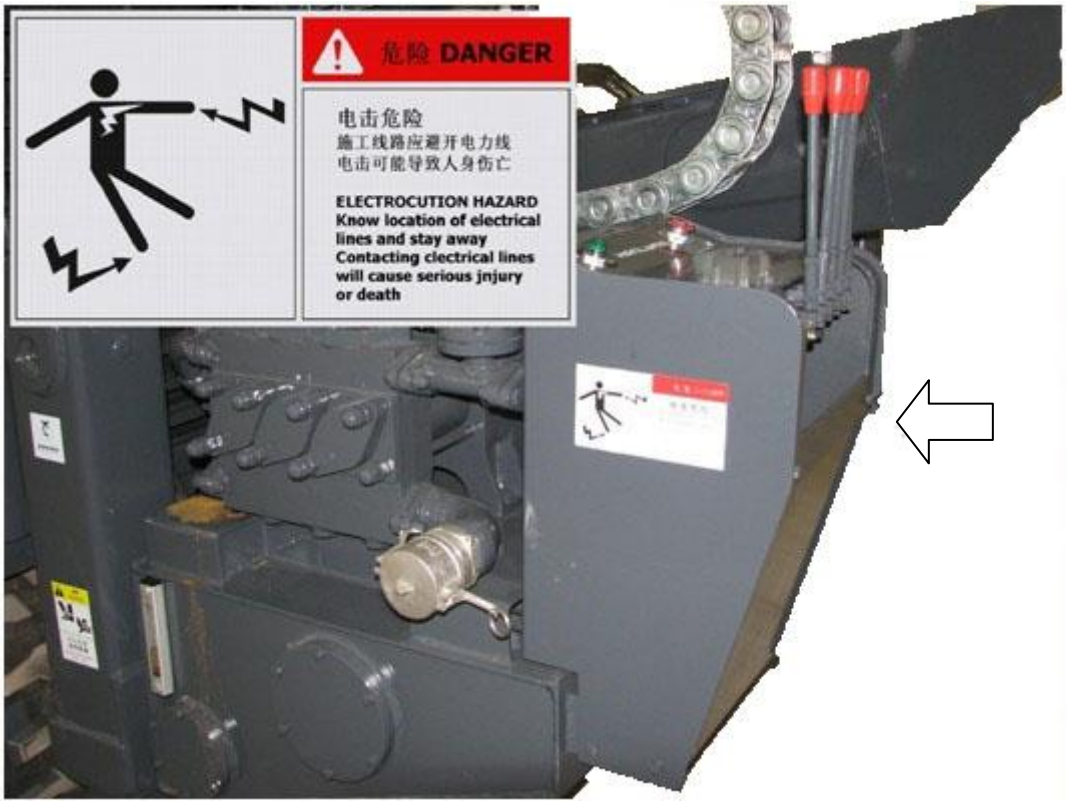
2. Dangerous Area of Machine Operation and Warn Identifications

a. Prevent Involved in When Operating.

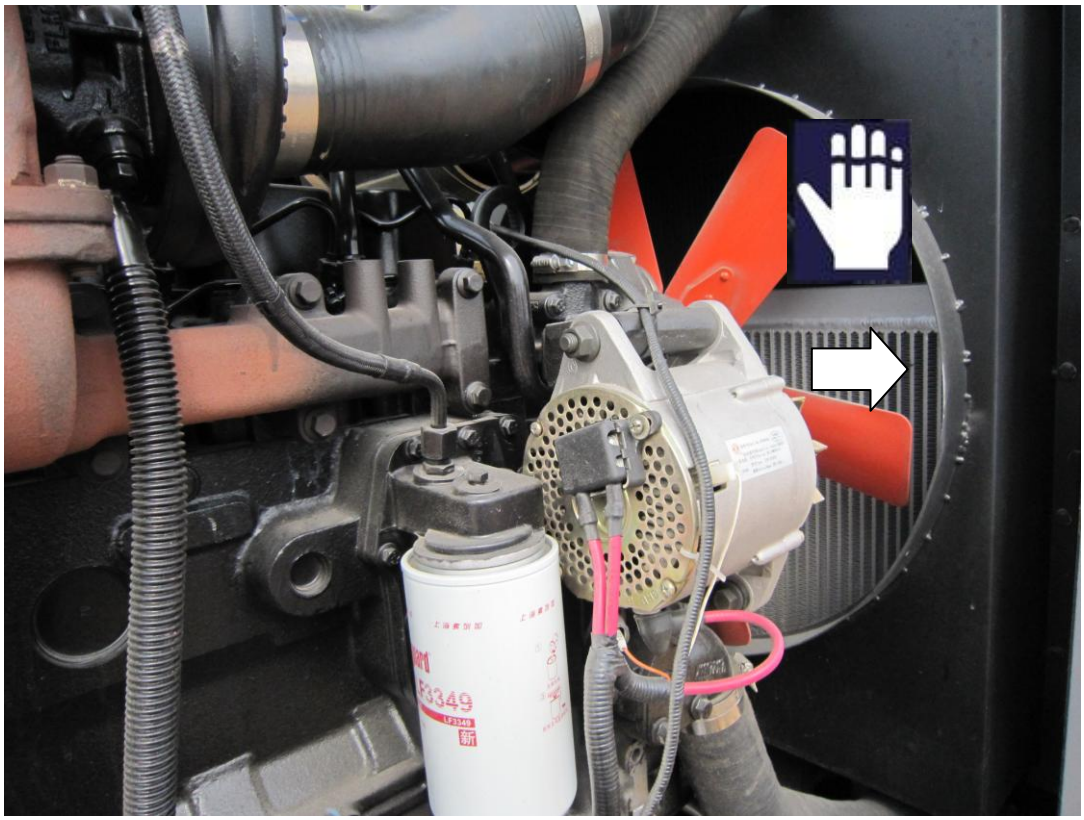
b. Keep your distance when operating to Prevent Hurting.



c. Protection from Electricity, the rest of the staff should not touch when the machine in drilling.



d. Hands should not get close to the rotating objects when operating.



3. Avoid personal injury

When working under the machine you have to supported the machine or accessories properly .Don't rely on hydraulic pressure to keep the machine stable. Any attachment may drop down if the control agencies machine moving or the hydraulic pipe leak.

Unless there is other explain, otherwise you should not do any regulation when machine or the engine running.

When the machine is running, all place of moving parts can not have personnel stay

Avoid all rotation and moving parts.

Ensure that the fan leaves of the air fan don’t have any sundry.

Do not use the worn or the twist hinge wire rope .When moving or suit wire rope, please do wear gloves.

When removing the elastic objects such as spring, card ring and block lap, you should avoid the objects popping and hurt your eyes. And pay attention to whether there is someone nearby and don't touch injury nearby.

When use a hammer to make the parts apart, it may have some fragments fly out and be careful not to be hurt.

4. Fire extinguisher equipped

When the machine is in use, it shall be equipped with vehicular extinguisher container for more than 2kg dry powder, and ensure that the vehicular extinguisher container in an effective state.

General article

一、Caution of Using the New Machine

Before leaving the factory the new machine have through precision inspection and be tested on running .However, the first using should have plenty of running-in, so it can keep working for a long time smoothly and prolong service life.

When use a new machine, please follow the following matters:

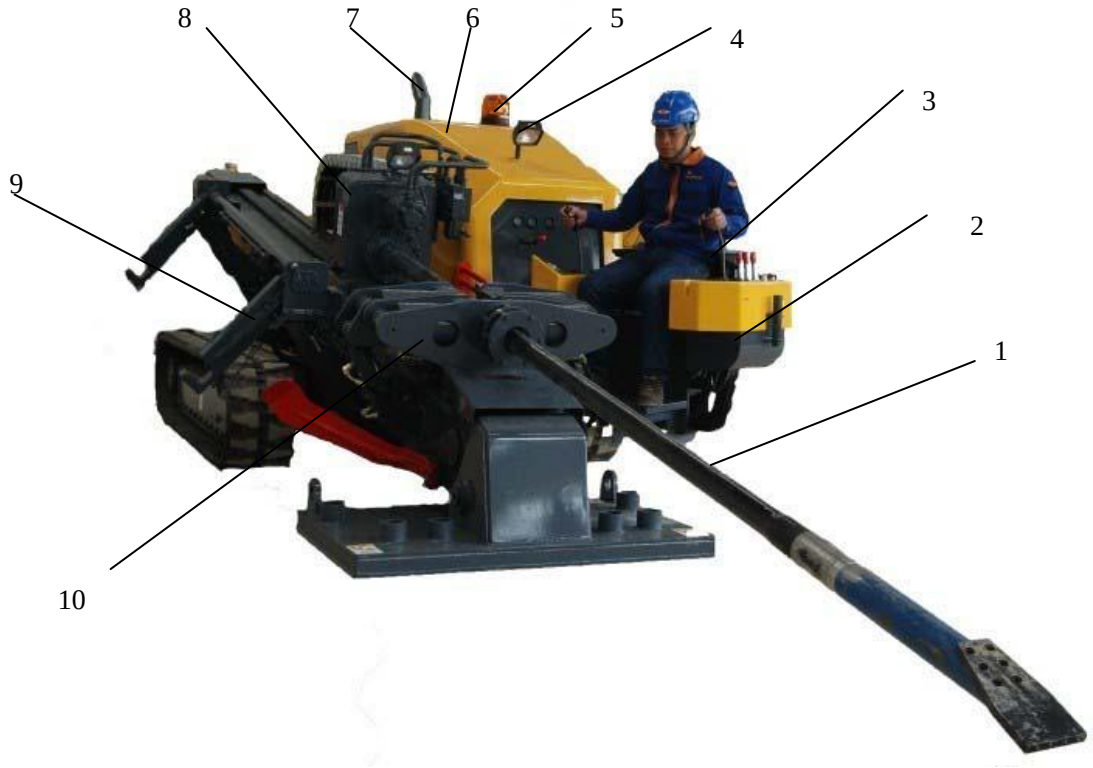
- No matter which season, before starting work, do make sure to make the idle preheating operate.

- Avoid making the engine idling (no high speed running)
- Avoid sudden increase to the engine accelerator.
- Do examination and maintaining as regulations.

二、Introduction of HL525B Horizontal Directional Drill

1. Exterior and Main Parts of Machine

The name of the host and mud preparation system mainly parts see picture 1 to picture 3

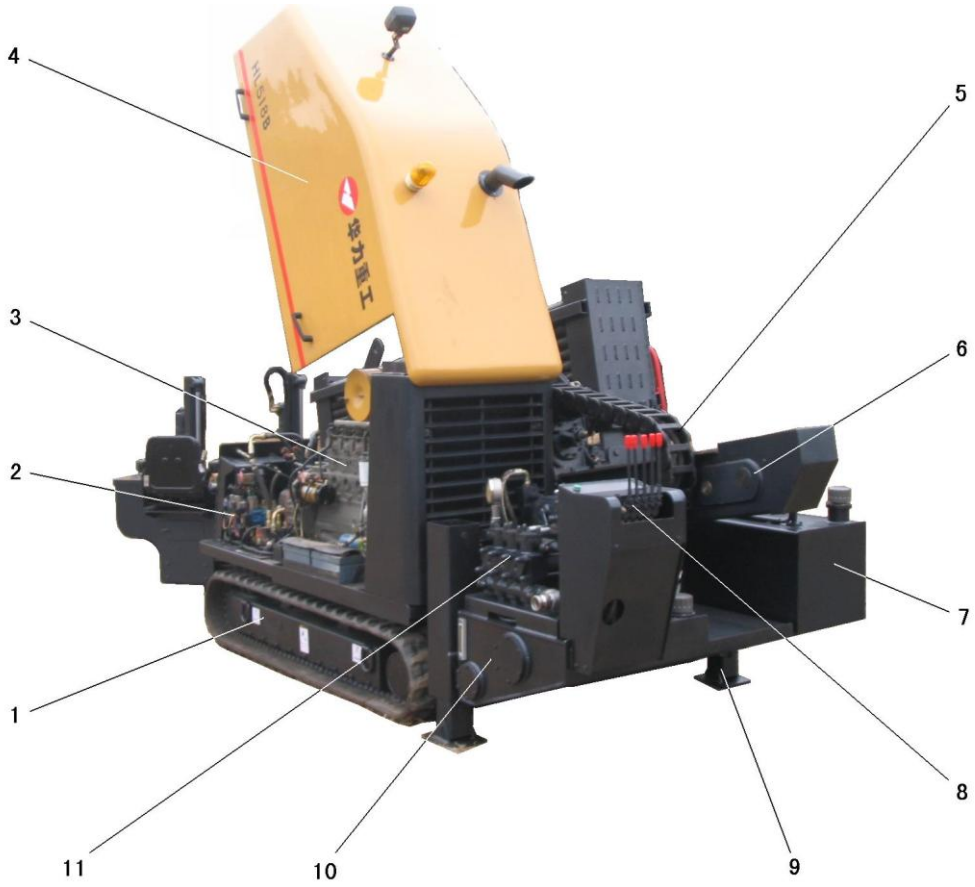


Picture 1 Host side and before

1- Drill 2- Control Console 3-Seat 4- Front Headlamp

5- Caution Light 6-Engine Hood 7- Exhaust Pipe

8- Power Unit 9- Semi-automatic Bar Changing Device 10-Clamp

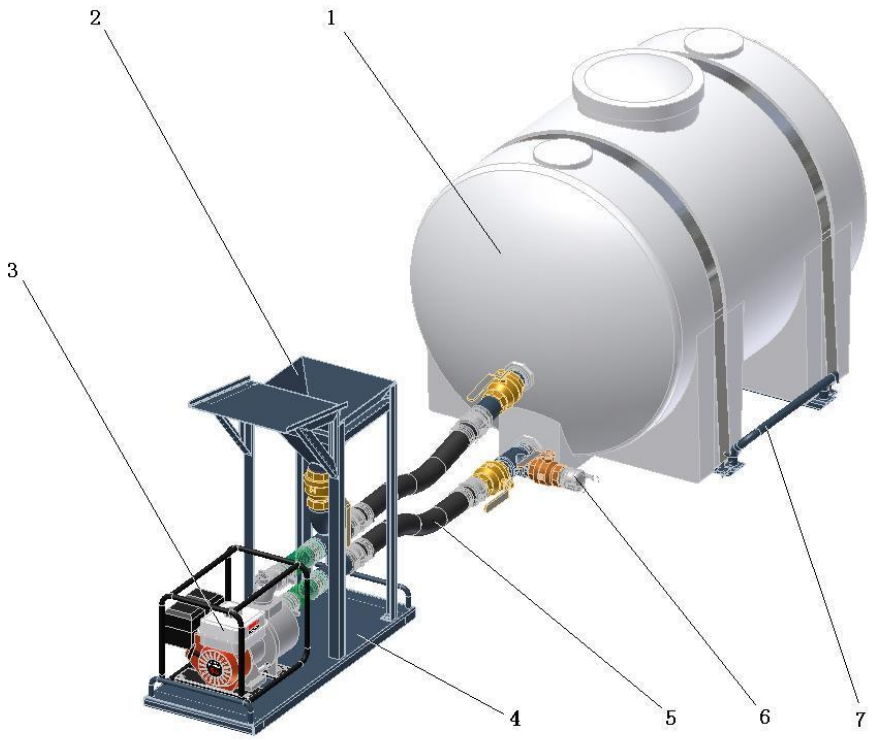


Picture2 Host back and side

1- Crawler unit 2- Hydraulic System 3-Engine 4- Engine hood

5- Tow Chain 6-Main Arm 7- Fuel Box

8- Rear Control Console 9- Branch Leg 10- Hydraulic Oil Tank 11- Mud Pump



Picture 3 Mud preparation system

1- Mud Tank 2-Gunk 3- Gasoline Engine Pump 4-Mud Stood

5- Mud System Connecting Pipe 6- Seal-capping（ Mud Export） 7- Mud Tank Support

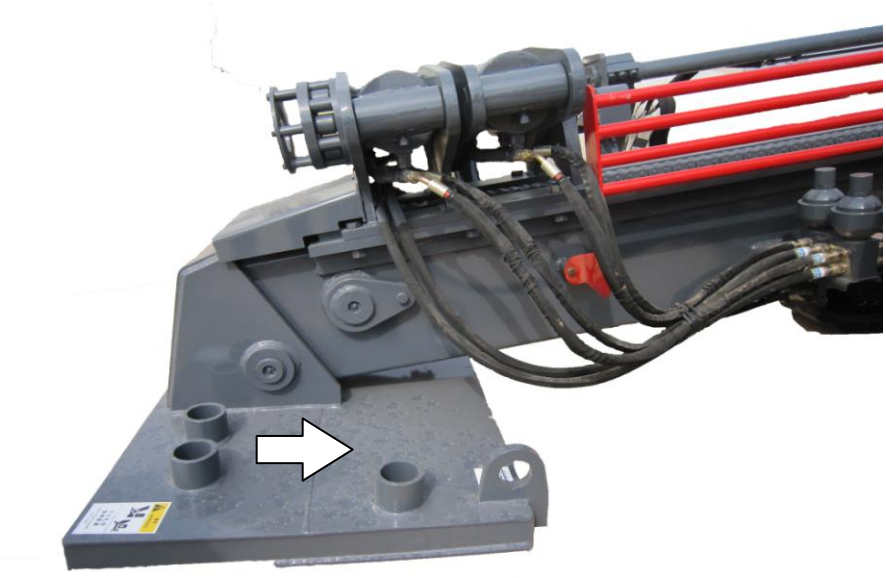
2. Main parameters and external dimensions of the machine

Engine Power 132 kW	Engine Speed 2200 r/min
Biggest Force to Drag Back 250Kn	Biggest Pushing Force 165kN
The Maximum Torque 8000Nm	Spindle Speed 0-110 r/min
Drill Pipe Specificationsφ73	Length of Drill Pipe 3m
Incident Angle 9-20º	Capacity of Mud Water Tank 2 m^3
Maximum Flow of Pump 22 m^3/h	Working Weight 8.5 t
Capacity of Fuel Tank 200L	Capacity of Hydraulic Tank 172L
Forward Speed 1.3Km/h	Leave Angle 20º
System Voltage 24V	Climbing Ability 25º
Host Length 6000 mm	Total Wide of Host 2100 mm
Total Height of Host 2100mm	Length of Mud Pump Station 1210 mm
Total Wide of Mud Pump Station 500 mm	Total Height of Mud Pump Station 1180 mm
Length of Mud Tank 2180 mm	Wide of Mud Tank 1430 mm

Total Height of Mud Tank 1450 mm

3. Lifting of Machine

When lifting the hoisting machine you can see its before and rear side of the ear position as picture 4 and picture 5.



Picture 4

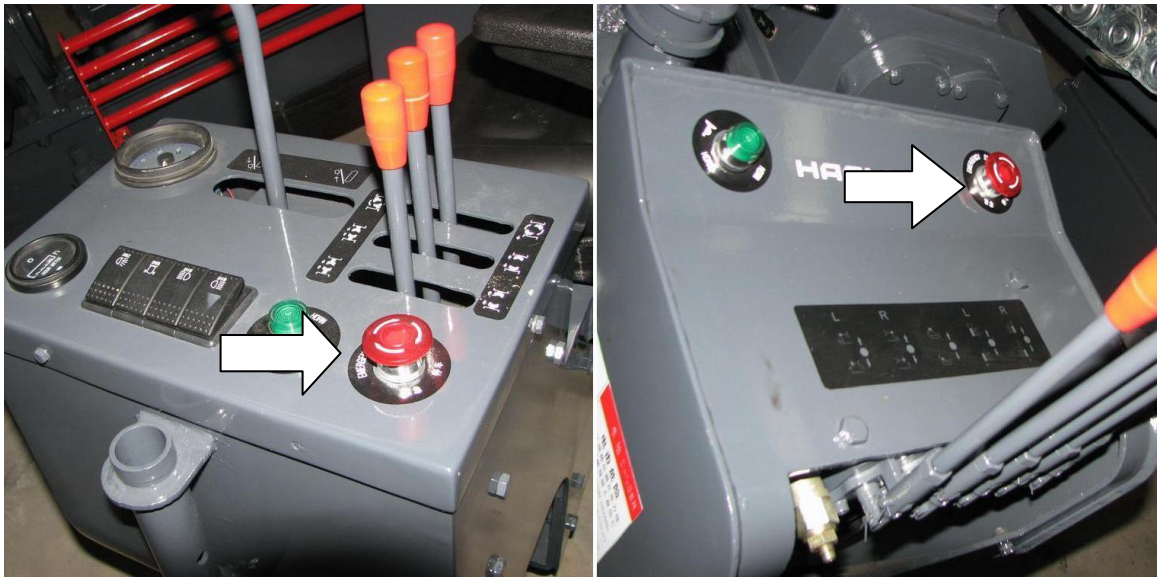
Picture 5

Operating

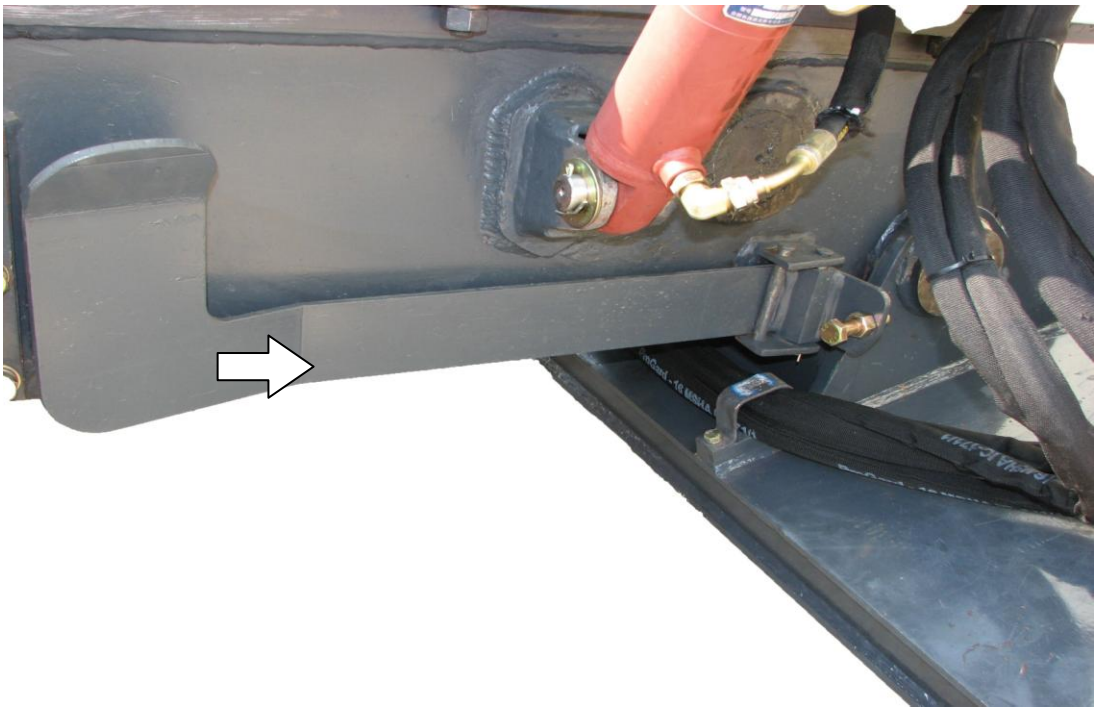
一、Start and Stop An Engine

1. Preparation before Starting an Engine

Check whether the two emergency stop knob which is located in the left of the lord control console and the control console after the manipulation of the two on the stage after the are in pop-up condition, and ensure it's effective. See as Picture 6



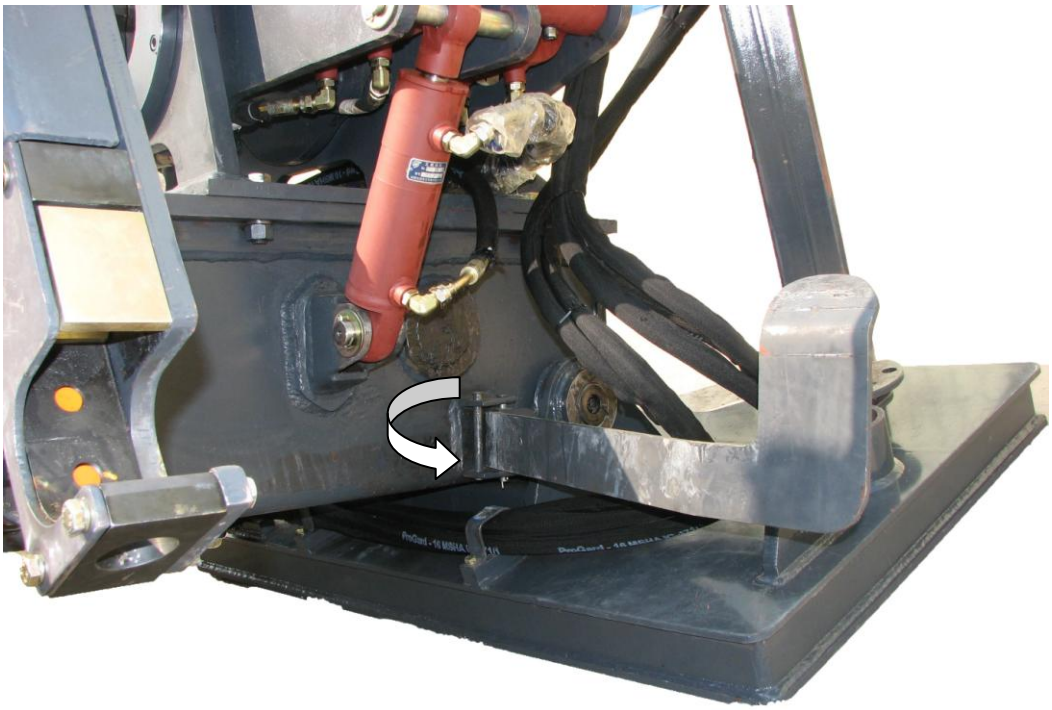
Picture 6



Picture 7

Pull out the spacing locking pin in the front side of the main arm , open the 挡板 which is

used for drill pipe spacing（see as picture 6 and picture 7）.



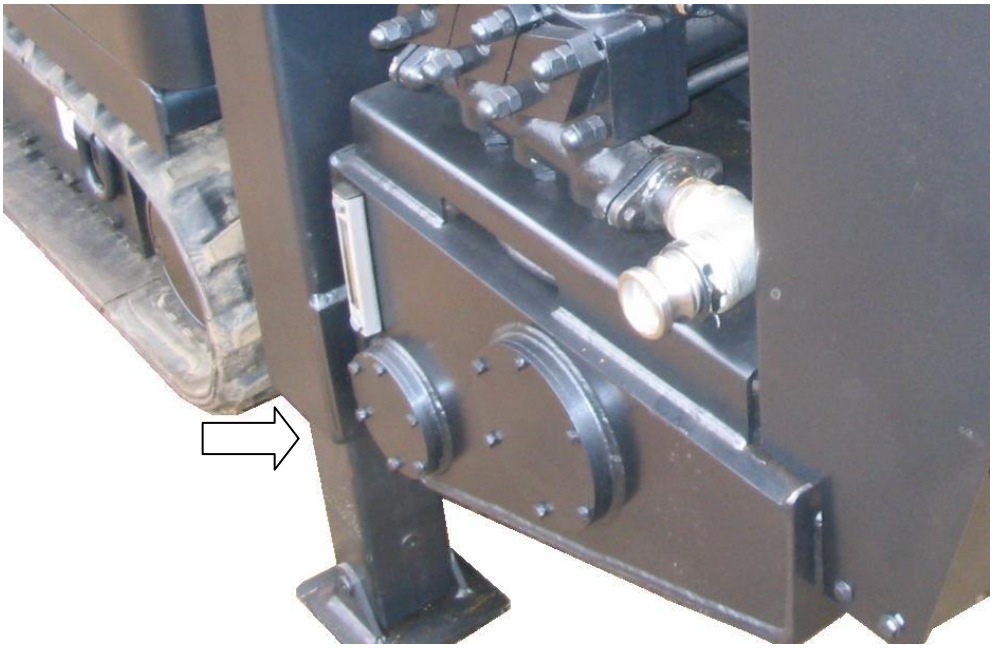
Picture 8

Open up the fixed the handle of the control console, turn the control console to the back of working position and down lock the handle. （See as picture 9）

Picture 9

Move the handle at the bottom of Seat. Adjusted the back and forth of the seat to move it to suitable location.

Connect the delivery pipe quick change connectors of the mud preparation system to the mud pump inlet of the rear of the machine. (See as picture 10)



Picture 10

For your own safety and machine's maximum life, before starting the engine you should look around to check the machine's condition.

Check the machine around or its bottom to see if there are any loose bolts, waste oil accumulation, or cooling agent leakage, damaged or worn parts.

Check Before Starting the Machine

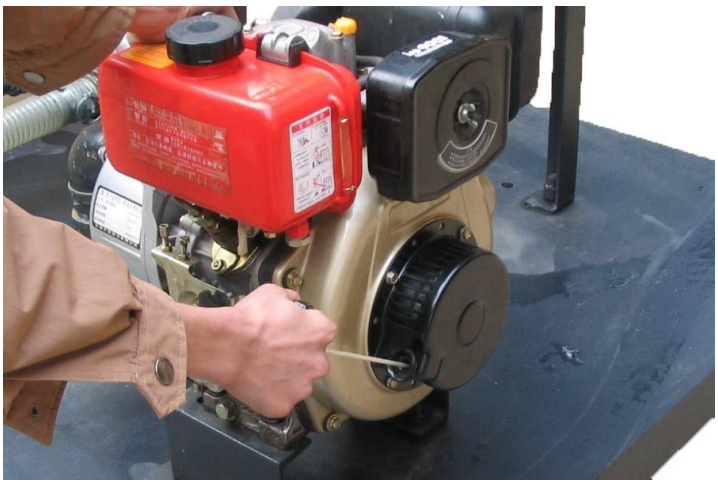
Check all hydraulic oil, engine oil, cooling fluid and fuel oil level and so on.

Open up the fixed the handle of the control console， turn the control console to the back of working position and down lock the handle, Move the handle at the bottom of Seat. Adjusted the back and forth of the seat to move it to suitable location.

2. Making of Slurry

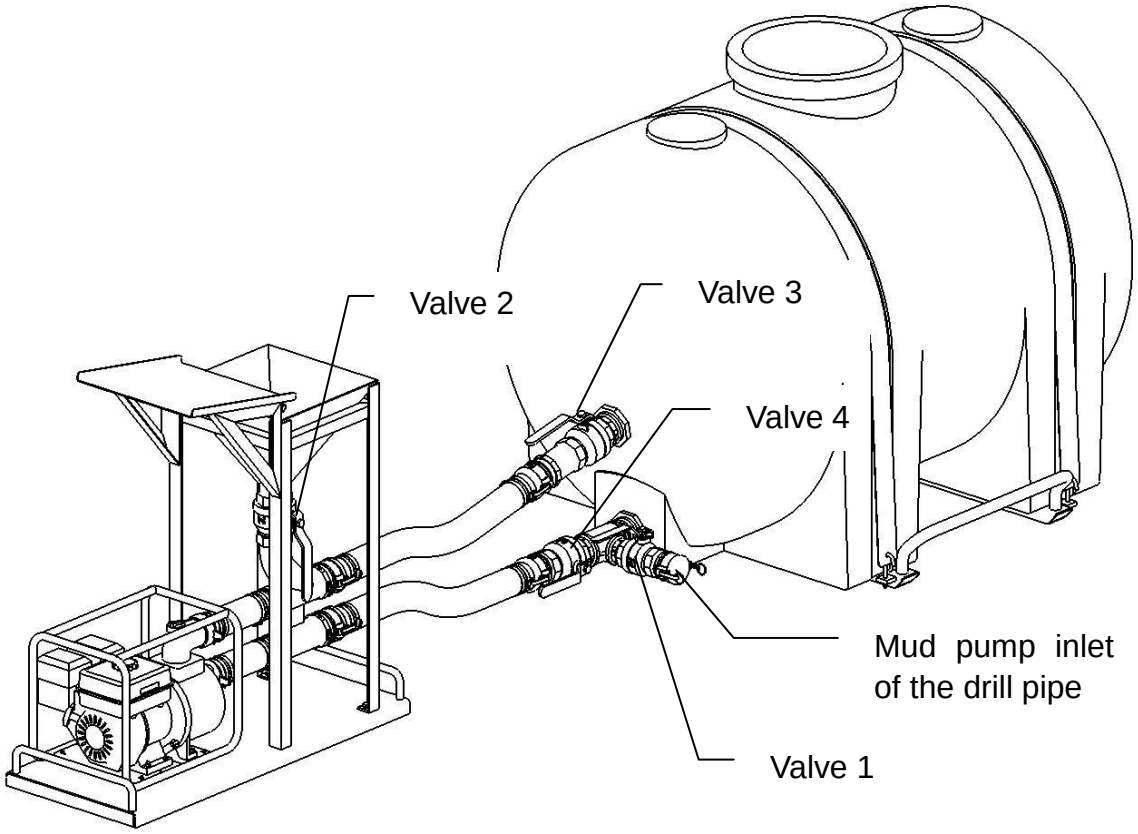
a. Open funnel's cover plate（see as Picture 11）,make the bentonited bag opened and place it on the open cover plate.

Picture 11



Picture 12

b. Connect the mud cans to the mud mixing station through two of the hose and through fast connection as f picture 12shows , And make the mud tank full of water （About 2 cubic）.
c. Close valve 1，open valve 2,valve 3 and valve 4（as picture 13 shows）
d. start the pump gasoline engine
e. Add bentonite from a funnel slowly, on the function of flow water the bentonite will be constantly into the mud tank
f. After the completion of bentonite, then shut off valve 2. Let the water pump stir continue circularly until the mud fully stir.



Picture 13

g. Connect one quick change joint of the long water pipe to the end outlet of mud tank and the other to the drilling mud pump inlet. Open valve 1，close valve 2,valve 3 and valve 4, then the mud preparation completed.

3. Start an Engine

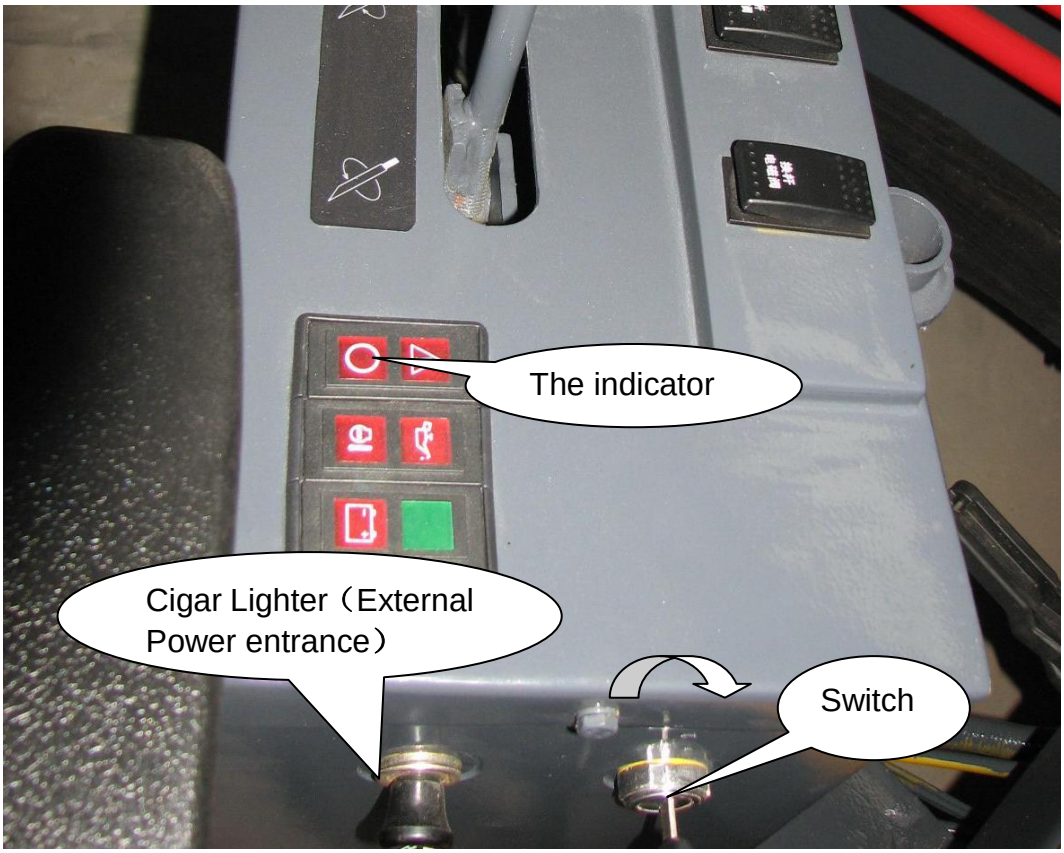
Insert the key to the electricity lock switch, then, turn clockwise. First open power of the machine, at this time the red power indicator bright. Continue to turn the key clockwise to starts engine.（showed picture 14）

4. Stop the Engine

Rotate counterclockwise the key of the electric lock switch then engine flameout. And then take off the key.

Caution

In order to extend the life of battery and the motor, the starter shall not operate unceasingly over more than 15 seconds, before starting again you have to wait for 1 minute later.



Picture 14

5. Antifreeze of the Machine

In order to prevent the mud pump freezing, when use machine in cold areas you should choose the mud pump of antifreeze storage tanks.

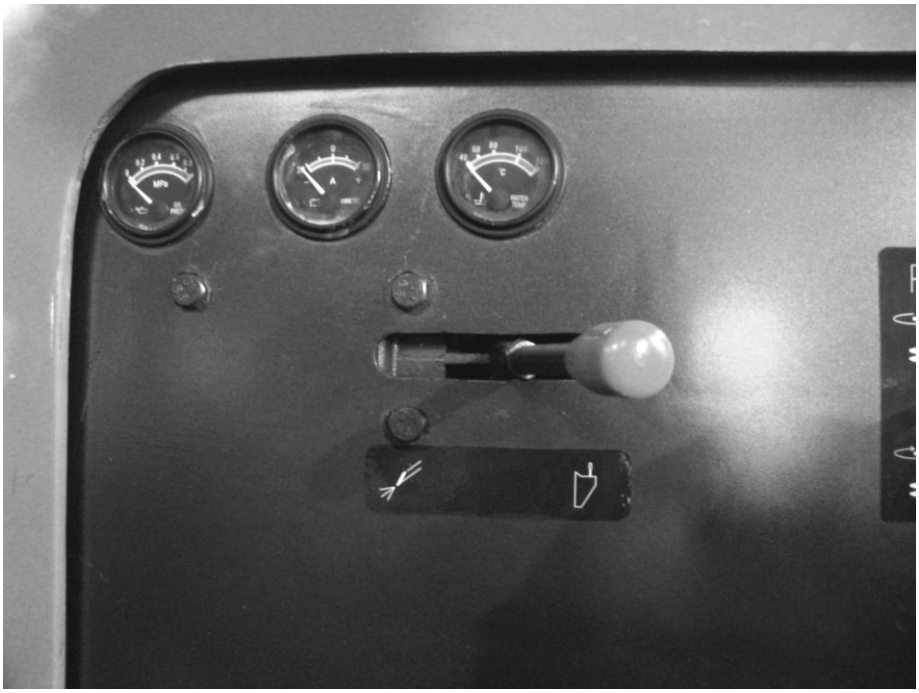
Picture 15

（see picture 15）.Before stopping the machine, after covering the mud pump suction with block cover and then open the under valves of antifreeze tank, make the mud pump move to the power head diameter changed stem ,stop when it has water out.

Then close the under valves of antifreeze tank .

二、The Basic Operation of The Machine

1. Machine's Walk and In Position



Picture 16

a. First you have to turn the oil switch handle to of engine cover's front panel as picture 16 shows, at this time each control handle of the rig tail control console can be under effective action.
b. Manipulation of each drilling rig of the control handle control console could make the rig walk before and after, steer, the rise and fall of a leg after t and adjust the function of the boom angle (Refer to the handles nameplate)

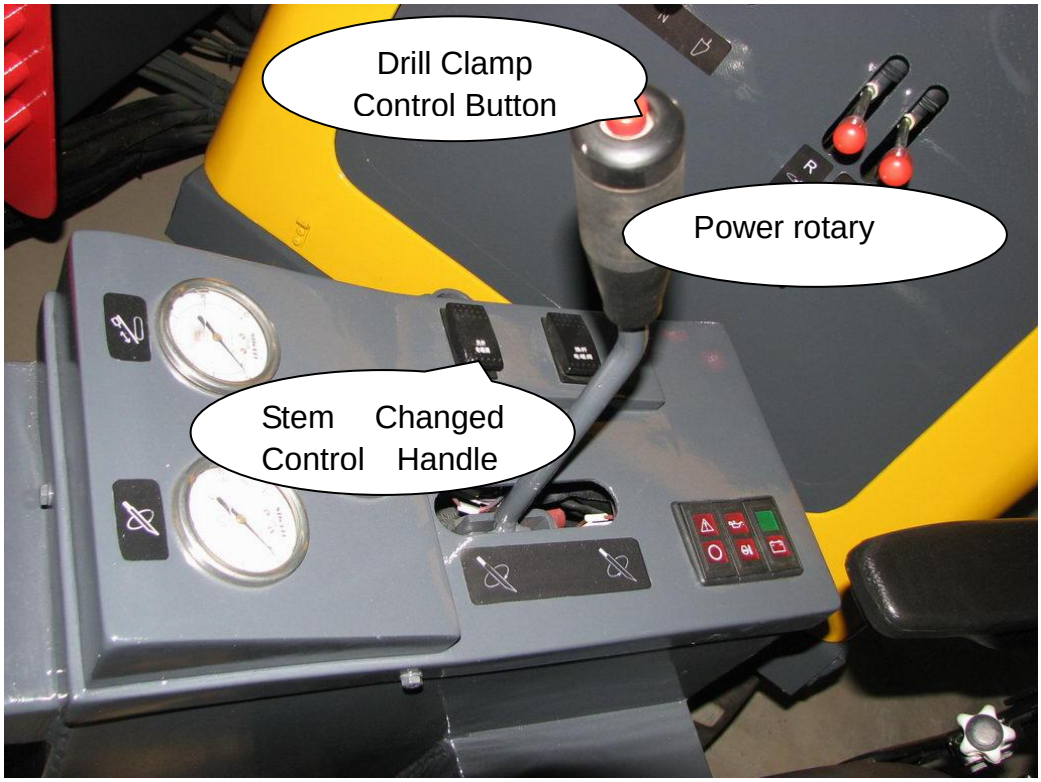
c. Anchor operation

This machine is artificial to anchor.

2. Power Head Into , Drag and Rotation

The left handle of control console control drilling and drag power head back（picture 19）.The top button of the handle is the button to fast into the back of the power head , the

right handle control the positive and the negative spin of the power head（picture 17）. The top button of the handle is the drill pipe clamping control button, this button can be press when change stem operation to prevent the turning and sliding of drill pipe.



Picture 17

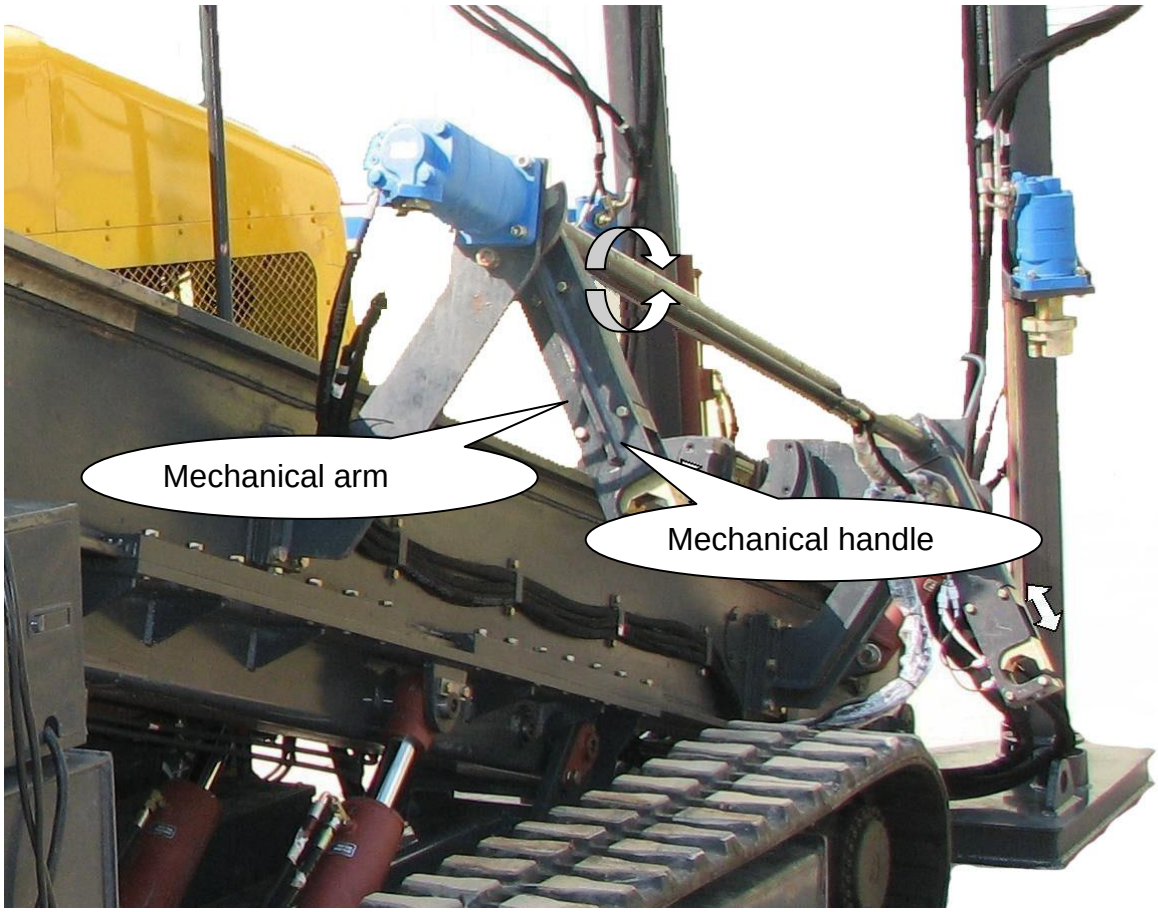
3. Operation of Replacing Pipe

HL525B rig has auxiliary stem changed device, and realize semi-automatic drill pipe function of loading and unloading (see figure 18). By the two electronic control buttons on the right side of control seat can control two mechanical pilots to pipe clamping and pipe is, reverse to flip.

Operation of Inserting the Drill:

a. Turn the mechanical arm to the right of the drill pipe, loose the mechanical hand and placed the drill pipe in the mechanical hand, make the front of the drill pipe touch stopped board.
b. Manipulate mechanical hand and clamp the drill pipe, flip the mechanical arm, send the drill pipe to the nipper jaws among the clamps.
c. Make the power head spin and forward, until the diameter changed drill pipe into the drill pipe.
d. Loose the mechanical hand and release the drill pipe, make the mechanical arm flip to

the right of the drilling pipe again and put it into the next drill pipe.



Picture 18

Caution

If not clamping drill pipe and you try to flip mechanical arm. As a security protection, the alarm will alarm and refuse to make movement. At this time, you should clamp the drill pipe and turn mechanical arm.

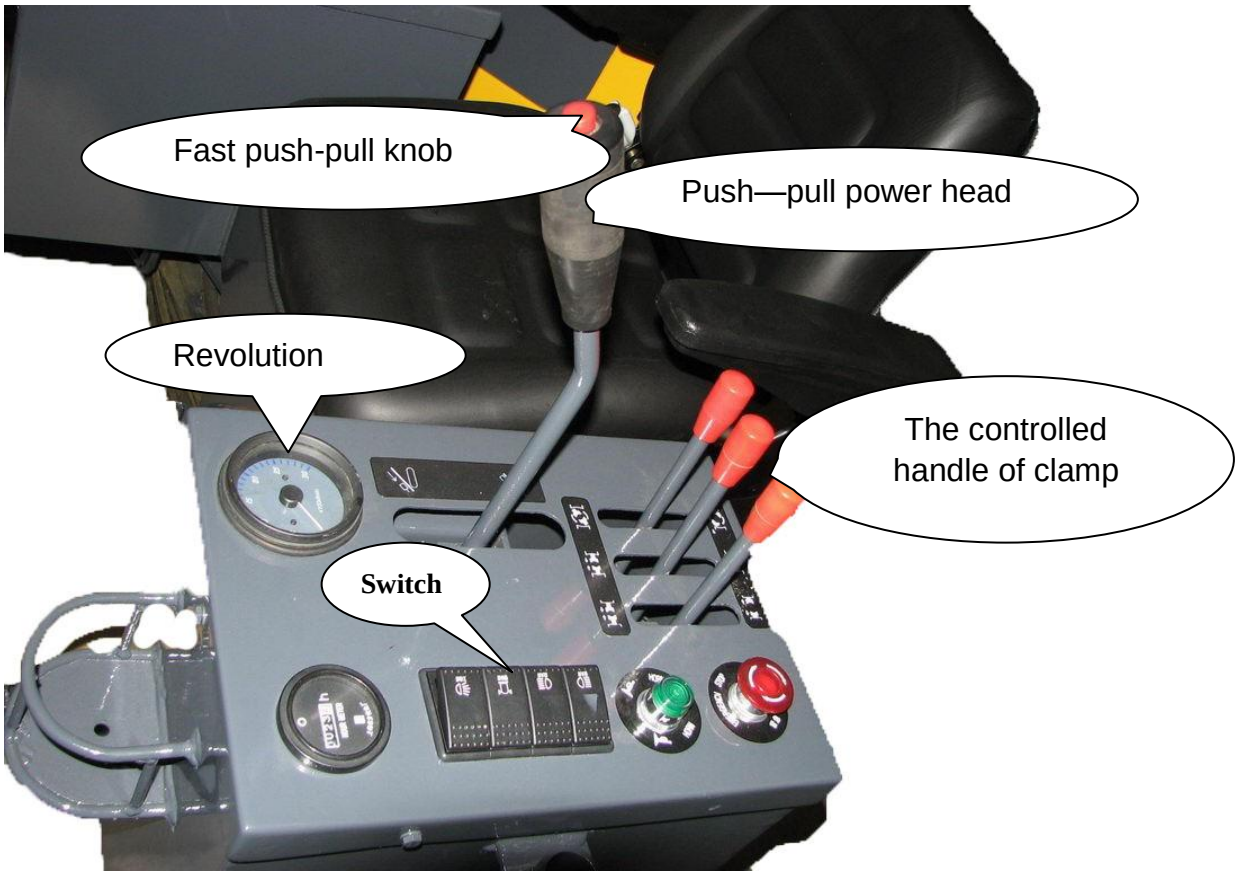
Operation of removing drill pipe:

a. After removing the rings of the drill pipe, turn to the right mechanical arm of the drilling rig inside (right now the manipulator should be in the loosen state), to make the mechanical arm reach the drill pipe. Manipulate the mechanical handle and clamp the drill pipe.
b. Make the power head reversely spin until the changed diameter of power head and the drill pipe loosen completely.
c. Carry the mechanical arm flip to the right of the drilling pipe. Loosen the mechanical arm

and take the drill pipe.

4. Operation of Clamp

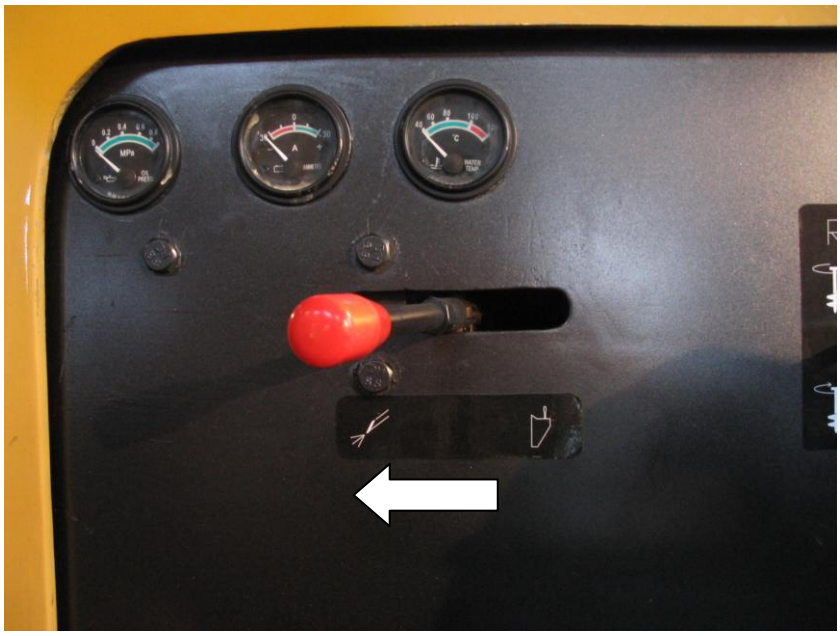
The 3 joystick located in the left side of the control console is the clamp control handle. From left to right they control the clamping-loosen of the fixed clamps, the clamping-loosen of the swinging clamps and the shackles-reset of the swinging clamp.（See picture 19）



Picture 19

5. Operation of Grouting

When the oil switch handle on the front panel of engine cover turn to direction as picture 20 shows，mud pump could work，the mud will shoot from the drill.



Picture 20

If need to adjust the mud pump flow，you can realize this through changing the two handle which are located in the mud pump. When need to change the mud pump flow or replace pipe operation，you should first pull the oil to the middle position and stop grouting.

三、Operation of The Machine When Construction

1. Operation Steps of Drilling Process

The first drill pipe in place and the installation of the direction drill ：

a. make the power head back to last.

b. Move the mechanical arm to the right of the drill, turn loose the machine handle and place the drill pipe in the mechanical hand, the front of the drill pipe should touch spacing dampers.

c. Manipulate the machine clamping drill pipe and flip the machine arm, send the drill pipes to the mouth among clamps.

Operate the control handle to make the power head turn forward and slowly forward the power head. Until the drill pipe rotation, it said that the changed diameter of power head has combined with drill.

e. Loosen the machine handle and release the drill pipe. Move the mechanical arm to the right of the drill again and put it into the next drill pipe.

f. Continue to rotate and promote the dynamic head, until head of drill pipe stretch out a

certain distance beyond the clamp.

g. Install direction drill on the drill pipe

Open the mud pump, after the observation of mud drill out you can began drilling.

h. After drilling to the tail of the first and up to the position of the swinging clamp mouth，manipulate swinging clamp and clamp the drill pipe

Close the mud pump and make the power head rotate reversely，after the changed diameter of power head the power spin out completely. Make the power head back to last.

2）Follow-up drilling process

a. Manipulate the machine clamping drill pipe and flip the machine arm, send the drill pipes to the mouth among clamps.

Rotate and promote power head, daub buckle oil on the thread place of the drill pipe head，to the drill pipe head which is close to the tail of drill pipe should slowly moving.

After thread of the two drill pipes has started on stop promoting and at the time to continue few turns to make the thread combined firmly but not combine completely stop rotating, then loosen fixed clamp.

b. Continue to drill into and open the mud pump.

2. Begin to drag and the enlarged the hole after returning the drill pipe

a. After the completion of the pilot hole，loaded the enlarged hole and rotary joints on to the excavated head , begin to drag the operation of the enlarged the hole after returning the drill pipe.

b. Open the mud pump, forward and drag back the power head.

c. Stop dragging back when two of drill pipe arrive to the middle of the clamp

d. Manipulate the fixed clamp clamping drill pipe

e. Close the mud pump, manipulate swinging clamp and clamp the drill pipe.

f. To turn to the right mechanical arm of the drilling rig inside (right now the manipulator should be in the loosen state), to make the mechanical arm reach the drill pipe. Manipulate the mechanical handle and clamp the drill pipe.

g. Make the power head reversely spin until the changed diameter of power head and the drill pipe loosen completely.

h. Manipulate the fixed clamp clamps the head of drill pipe, make the power head reverse

spin and loose the screw between the stem of pipe diameters changed, the power head continues to move back reverse until the drill pipe threads loose completely with the power head diameter changed.

i. Loosen the nipper jaws of the swinging clamper. Take mechanical arm with the drill pipe to the right of the drilling machine. Loosen the machine and remove the string。

j. Promote the power head，stop until the changed diameter of power head near the tail of drill pipe of swinging clip and buckle oil on the thread place of the changed diameter of power head. Manipulate the power head forward and promote the power head slowly to make it combined with thread. When the thread does not fully combine you can loosen the swinging clamp.

k. Open the mud pump，make the power head forward and drag back the power head.

Caution

Between the power bit and bracket should have some free trip, in the process of relaxing and gripping, as the power rotating, the power head can then free in a certain distance. Do relaxing, gripping the operation should pay attention to.

Power can be free of the head keep a state, to avoid the damage of drill pipe silk buckle.

四、Requirements of Operating Place and Climate Conditions

1. The working area of the machine should be at the basic level and the slope shall not be more than 1:10.

2. Working on the muddy ground or easy subsidence ground,, use thick board and so on between the anchor and a leg and the ground

3. When it is the thunderstorm or snow weather there is no construction allowed.

Maintaining

Warning

If overhaul need to start the machine, there have at least two people present, and both are familiar with the safety rules of machine maintenance. One maintains and the other is

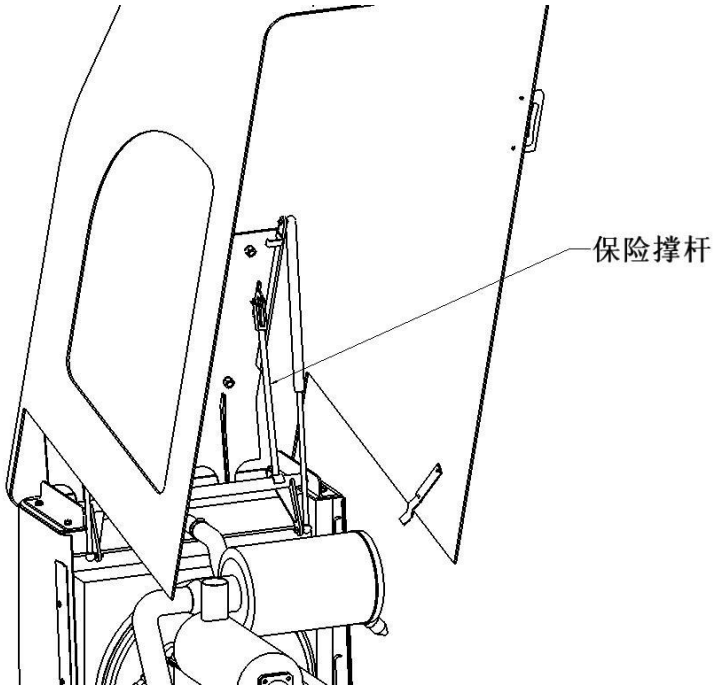
responsible for monitoring site's safety and protection .The two people should be able to communicate and contact easily.

People who are responsible for monitoring must be able to get access to emergency stop switch easily.

The repair place should have very good lighting.

Warning

Open the boot to maintain within the machine, you must fix the insurance poles. Not rely on spring poles to support the machine hood only（see picture 21）.



Picture 21

一、Standard of General Torque

Caution

The bolts and nuts remove from the machine to should be kept good for assembly to use. If need new fasteners, they must be the same in level and the size and as the changed pieces.

The strength of the material are usually marked on the bolt and with digital head (8.8, 10.9, etc.) said. The table below gives standard torque of the 8.8 magnitude bolt and nut.

Thread sizes	Standard torque（（N.m）
M6	12±4
M8	25±7
M10	55±10
M12	95±15
M14	150±20
M16	220±30
M20	450±70
M24	775±100
M30	1600±200
M36	2700±400

二、Standard of　the Working Oil

Information of work oil

Caution

All the work oil must be cleaned, the hydraulic system must be to 18/15 (GB/T14039-93) or NAS9 level requirement.

Diesel engine oil:

Use the following recommended diesel engine oil: API standard CD/SD，CD/SE，CD/SF，CD/SG or CD

Suggest this machine to use oil winter CD30 in winter, when summer to use the oil CD40.

Hydraulic system oil:

The hydraulic oil should be able to make hydraulic system components and hydraulic transmission components get the longest service life and the best work performance. Use the recommended hydraulic oil in most of the hydraulic system: API standard CC, CC/SF, CD/SF, CD/SG, CD, CE/SF, CE/SG or CE.

If need different viscosity of oil due to extreme environmental temperature need different

viscosity of oil, you also can use the engine oil we recommend.

The industrial use hydraulic oil of corrosion resistance, prevent foaming, prevent rust and prevent oxidation additives which are proofed by the supplier can also use.

Suggest this machine to use oil winter N46 in winter and when summer to use the oil N68.

Lubricate the grease recommended:

The lubricate grease recommended can be suitable for different occasions:

- **Molybdenum grease of a lot of use**

MPGM can be suitable for the place the overloaded bearing and joints, the high pressure oil will make the machine to the longest service life. Oil No.2 NLGI has applied in most temperatures.

If there is no MPGM grease you can use the multi-purpose grease of 3% ~ 5% molybdenum.

- **Recommend using lithium fat of many uses (MPGL) (not high to use)**

The No. 2 NLGI grease recommended is **suitable** for automatic lubrication of light load high temperature (up to 175℃). The grease provides excellent mechanical stability, antioxidant antirust function and good separation torque.

If there is no this grease you can use the similar multi-purpose grease.

Suggest this machine to use Mo.2 lithium base grease or No. 3 and no. 4 manufactured calcium.

Oil Viscosity and Work Full Capacity

The Label of Work Oil

Tank or system	the label of oil	℃	
		minimum	minimum
Engine fuel	0# Light diesel oil		
Engine oil	CD 5W-30 or CD 10W-30（winter）	-25	-25
	CD 15W-40（summer）	-15	-15

Power head with gearbox oil	SAE 10W	-20	-20
	SAE 30	-10	-10
	SAE 50	0	0
Hydraulic system oil	HM-N46 Anti-wear hydraulic oil (winter)	-20	-20
	HM-N68 Anti-wear hydraulic oil (summer)	-20	-20

Capacity of System Oil

Full capacity (approximate)	
Tank or system	L
Cooling system	25
Fuel tank	200
Engine oil	14
Power head with gearbox oil	3
Hydraulic oil tank	172

三、Notes to The Daily Maintenance

1. When the machine performance become not well it should find out the reason early and give early treatment. So the machine can be more effective perform and can increase its productivity, and also extend the life of the machine.

2. Before the maintenance you have to clean all the joints, lids and jams.

3. Carefully check the leakage, if there is any leakage phenomenon, find the leakage and repair it.

4. If you doubt or find a leak phenomenon, you should check the surface height of gas liquid constantly.

Engine Maintenance

This article about the involved maintenance of the engine, such as the provisions of the engine maintenance, all the engine maintenance manual shall prevail.

1. The Norm of the Cooling System

Cooling fluid:

Maintain the normal work temperature of diesel engine will improve the engine's efficiency。So，it is necessary to correctly maintain the cooling system。Overheating, too cold, pitting corrosion, gas crack, piston and cylinder head stuck and radiator jam is the common fault cooling system. In fact, cooling fluid, fuel and oil are equally important.

Caution

We suggest that adding 30% of the antifreeze into the cooling mixture. At the same time you have to join a certain number of cooling fluid additives.

Don't add the cooling fluid to the overheating engine, otherwise it will cause damage to the engine. Before adding the cooling fluid into the engine you should cool the engine first.

With the temperature when the engine operating, no matter how the antifreeze of all the corrosive water concentrate, it should add 3% to 6% of the additives to protect the cooling system.

When the concentration of the additive antifreeze of more than 6% and more than 65%, it may lead to the precipitate formation and this can cause the radiator pipe jam, the engine overheating and the pump failure to seal.

If inventory or move the machine to the sub-zero temperatures area, you should protect cooling system according to the possible minimum temperature.

Under the cold temperature you should frequently check the proportion of the cooling liquid to take enough protection measures.

If the cooling fluid is polluted, engine is overheating or a bubble founded in the radiator, you must clean cooling system.

Every 1500 hours or every year, you should drain cooling fluid and clean the system, at the same time to join the new cooling fluid.

The speed of joining the cooling fluid over 20 L/minute may cause the cooling system have a bubble.

After adding new cooling liquid and starting the engine, open cover until the cooling fluid at a normal operating temperature and the liquid surface is stable. If necessary, you need add the cooling fluid until it reaches the correct level

Cooling water:

Solid water, or the water of calcium and of high manganese ion mix with the silicon and phosphorus of the cooling system will easily cause the insoluble compounds.

The trend of silicon and phosphorus produces insoluble compounds will increase as the hardness of the water added. After the heating and cooling the solid water or the water of calcium and of high manganese ion will be easy to produce insoluble substance.

We recommend using distilled water to reduce the possibility and seriousness of producing insoluble.

The minimum of the available water	
Water ingredients	Limit gr/gal(ppm)
CL	maximum 2.4（40）
SO_4	maximum 5.9（110）
Total hardness	maximum 10（170）
Total particle degree	maximum 20（340）
PH value	5.5~9.0

ppm=quality of every 1 million particles

Using the water which meet the requirements can not completely prevent the generation of insoluble compounds, but at least can reduce the precipitation rate, and to the qualified level.

Antifreeze:

Caution

We suggest using the qualified cooling water and the antifreeze should also contains 30% of antifreeze to keep the water pump’s cavitation effect, so as to improve the temperature pump’s efficiency.

To protect the possible lowest environment temperature you can mix the antifreeze with the cooling water in advance. The number of the adding antifreeze based on the possible lowest environment temperature of the machine using area. But the cooling fluid in the concentration of antifreeze should not more than 60%, when the concentration of antifreeze

not more than 60% it will reduce the protection of engine antifreeze, and increase the possibility of the form of the cooling system.

Should buy the antifreeze contain as far as possible less silicate, and antifreeze of the cooling fluid additives of the moderate heavy diesel engines. This kind of antifreeze has the following advantages：

- Can obviously reduce the seal and leakage problem which are because the excessive concentration of chemical additives from the water pump.
- Use the antifreeze contains as far as possible less silicate and antifreeze of the cooling fluid additives of the moderate heavy diesel engines first don't have to join other auxiliaries.
- Mix the antifreezes of big number of silicate and the auxiliary in a certain time may produce may block solid, thus cause blockage, heat loss and pump seal failure.

Correctly add the antifreezes additives:

Take the pure antifreezes as a supplement to add to the cooling system directly is not an acceptable way. This will increase the concentration of antifreeze in the cooling fluid. You should mix water and antifreeze to join in the cooling system.

concentration of antifreeze	
Protection temperature	concentration
-15℃above	30% antifreeze，70% water
-23℃above	40% antifreeze，60% water
-37℃above	50% antifreeze，50% water
-51℃above	60% antifreeze，40% water

Refer to the table of concentration of the antifreeze upper（For your reference only. for details, see the instructions of you purchase.）

Additives of Auxiliary Cooling Fluid:

The antifreeze additives are used to prevent he engine parts rust, fouling, pitting corrosion and corrosion when mix with the antifreeze. Most antifreeze did not contain enough of the

auxiliary c antifreeze additives.

Caution

In the antifreeze you should always add suitable amount of additives or the corresponding solution. Antifreeze cannot be used independently unless use the additive antifreeze, in this case, begin to join antifreeze but not add additives, but in the maintenance process, you must join additives.

Use the antifreeze additives of the cooling system, the concentration will increase 3% ~ 6% in order to prevent corrosion.

In order to prevent the excessive anti-rust agent of the engine cooling system, the concentration of antifreeze additives should be no more than the maximum 6% we recommend.

On the high temperature surface of the cooling system the excessive concentration of additives may produce precipitation and form the thermal insulation layer of heat exchange to reduce the engine performance. The reduction of the heat exchange rate may cause crack of the cylinder head and other high temperature components. The excessive concentration of additives may also increase damage to the seal of water pump.

If you do not use the antifreeze mix with the cooling fluid in advance you must add the antifreeze additives.

When you first join cooling fluid in the new or the repaired engine, if you do not use the antifreeze, join every 30 liters of cooling fluid a liter of liquid cooling auxiliary additives or the relevant material, so that in the cooling system the concentration of the auxiliary additive will be 3% ~ 6%.

In order to keep the 3% ~ 6% of concentration, every 250 hours or change the oil (whichever comes first) you should join auxiliaries.

Fuel standard

Fuel rule

Caution

After working a day, you should add fuel and clean wet air out to prevent condensation

Don't filled fuel tank, when the temperature rises the fuel will be expanded and may overflow

Before putting on a fuel filter you can't add oil to the fuel. Impurities fuel will accelerate the damage to system components.

The diesel you add must go through 72 hours' precipitation in order to ensure it's clean.

At the beginning of every day or after filling fuel 5 to 10 minutes are allowed to stay to clean water and sediment from fuel rank.

After the change of the fuel filter, rank out the air from system.

Before filling the fuel tank you should clean the water purification and sediment storage weekly. This will help to prevent water and sediment flow into the fuel system.

Only the recommended fuel can be used in this section.

Fuel Types

The winter in the northern region of China suggest no. 20 (-20℃) light diesel oil), no. 10 in summer (-10 ℃) or 0 light diesel oil; the southern region in winter suggest using 10 light diesel oil, in summer suggest using 0 light diesel oil.

Requirements of Diesel Hexadecane

Use the smallest diesel fuel of the injection engine hexadecane value is 40.

Diesel Low-freezing Beginning

In cold weather, the diesel waxy may occlude diesel oil filter. Diesel low-freezing must be below the air temperature of environment to prevent diesel waxy and the loss of power.

Sulfur of Diesel

The percentage of sulfur diesel have influence on the selection engine oil .In the process of burning the sulfur will have a chemical change to make the sulfuric and sulfite .These acid can corrode the surface of metal.

Some additives lubricating contains alkaline compounds, and the alkaline compounds can counteract acid. The corrosion value of Lubricating oil contains generally call the total alkali value (TBN).

To counteract combustion gas produced in the acid and reduce corrosion, the total alkali value of the engine oil (TBN) must be higher.

As the sulfur diesel less than 0.5%, any engine oil of API level should have enough total alkali value (TBN).

If the number of the diesel sulfur is more than 0.5%, the total sulfur value of engine oil (TBN) should be 20 times of the oil, available way ASTM D-2896 to measure the number of the sulfur.

If the number of the diesel sulfur have more than 0.5%, and the total sulfur value of engine oil is 30, and cycle of lubricating oil change should be shorten the half.

Regularly get the data of the sulfur number from diesel, each batch of sulfur number content in diesel in sulfur may not the same.

Air intake system

Checks daily the thick dust and impurities of the filter and, when necessary, clean the dirt and impurities. Crude filter can be cleared six times before scrap. When cleaning up filter, you should be thoroughly checked in the filter material if there is break. Replace a crude filter every year, even if the clean up number is not up to six times.

After 3 times of maintenance for thick filter, you should replace fine filter.

After installation of a clean coarse strainer the engine still discharge black smoke you should install a new fine filter.

Caution

Don't try to through the clearing to reuse the fine filtration and every time you should replace all of new, otherwise the engine may be damaged.

2. The Use and Maintenance of Rubber Crawler

Rubber crawler is the important part of the horizontal directional drilling in the mobile mechanism, and the price is more expensive. The service life of the rubber crawler to a great extent depends on the work environment and method of us, so you must attach importance to the early wear prevention the rubber crawler.

1) Attention to the work environment

a. The rubber crawler should avoid contacting the oil, diesel oil, grease, etc. Also should avoid contacting the acid, alkali, salt, pesticide, and other chemicals. This case you should clean and clear the rubber crawler in time.

b. Rubber crawler should be avoided walking on sharp spike stones and uneven road. When necessary you could lay flat board or other objects.

c. Rubber crawler should be avoided in the gravel and on the gravel road driving long distances. This case will extremely easily cause early damage on the rubber surface, if travels far away it should use loaded vehicles transfer.

2) Master correct method of using

a. Rig on the orientation as far as possible and avoid long distance running back.

b. When drilling machine parking too long, you can make the rubber crawler leave completely from the ground through the manipulation of the lord and leg after erecting to let rubber crawler have to bear a long time.

c. After using the rubber crawler should be timely maintained and cleaned. In order to prevent the rubber tracks wearing and corrosion speed up after working the machine need to be cleaned every day.

d. In the process of walking should reduce sharp corners as many as possible. Sharp turn off will extremely easily cause damage and it also produces crawler guide wheel or guide rail crash and make core iron fall off.

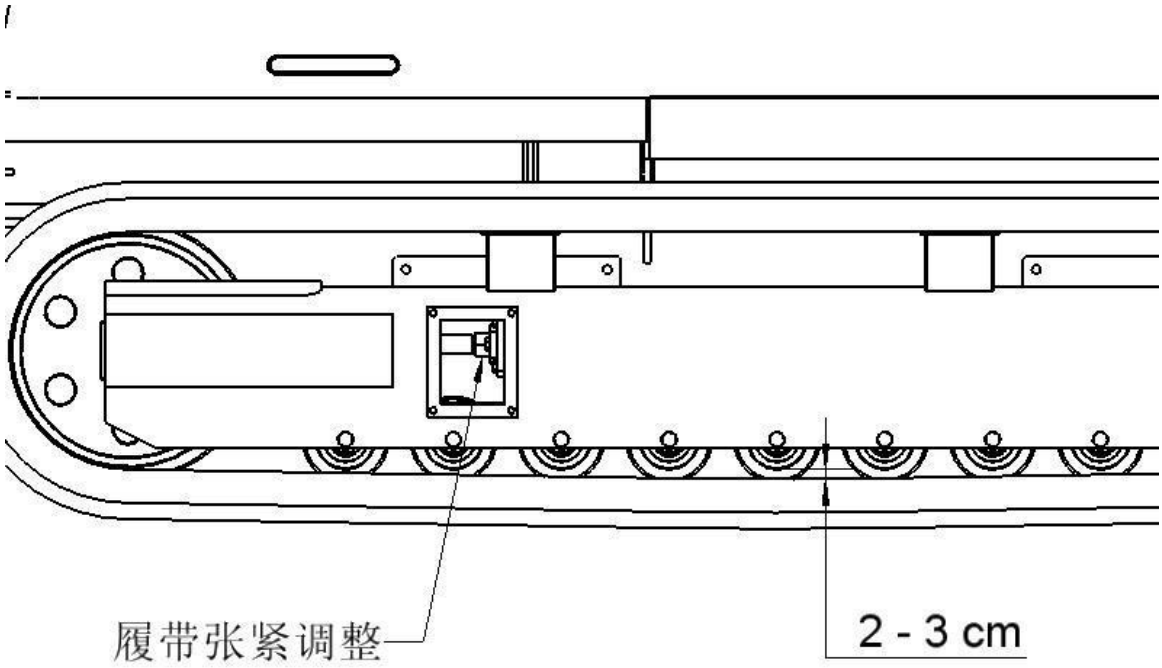
e. Always check the wear of drive wheels, guide wheel and the heavy wheel. After

serious driving of the driving wheel it will increase the clearance of the gear and core iron, and produce great impact, when it is serious it will tick the core iron. The wear seriously drive wheels, guide wheel and heavy rounds and etc should be replaced immediately.

f. It is not good to walk on the steep road ； Walking across the bridge type, walk on the step friction edge；walk up the steps by forcing and so on。These abnormal driving will lead to injury, core iron crawler decorative pattern break, edge cuts tracking, steel cord fault and so on normal damage.

3) Note to adjust the tension degrees of rubber crawler.

The rubber crawler should keep the normal tension degrees. Not too loose or too tight. When the tension degrees too loose, it may make rubber crawler derail and the guide wheel and carrying wheel ride teeth. When the tension degrees too tight it may produce great tension and cause the elongation of crawler and change pitch, in some local it will produce side of high pressure and will damage the core iron and the drive wheels more faster. When using you should always check and adjust the rubber crawler。Adjustment should be giving on the flat hard ground (the cement ground). Through the manipulation of the boom tilt and erecting, a leg after to leave the ground completely. Open the side cover plate of the crawler frame .Using a wrench to rotate screw so the crawler can gradually tense. Make the clearance between a heavy round and crawler to the specified standard.（see picture 22）



Picture 22

四、maintenance intervals

When needing maintenance

Engine breathe system——Filter Maintenance

Battery——Check

Radiator——Replace the lid and clean up the heat dissipation core

Cooling System——Replace the cooling fluid

Fuse——Replace

Power head prevent grind board——When damage happens it should be replaced

The maintenance of every 10 hours every day

Engine oil ——Check the oil level

Hydraulic oil——Check the oil level

Cooling System——Check the oil level of the cooling fluid

Fuel tank——Discharge water and the sediment

（MPGM）The boom slippery lubrication ——Daub grease

Patrol inspection——Check the machine

Instrument and light——Test

The maintenance of every 50 hours every day

Check the fore-mentioned project first

The spindle arm slippery lubrication（MPGM）——Daub grease

Chain lubrication（MPGM）——Daub grease

The engine and the main pump hinged pin（MPGM）——The lubrication two hinged place

The maintenance of every 100hours every day

Check the fore-mentioned project first

The internal sprocket of boom lubrication（MPGM）——Grease filling（Open the round cover plate of the boom arm and move the power head ,you can see the nozzle）

Other exposed yellow nozzle on the machine（MPGM）——Grease filling

The maintenance of every 250 hours every day

Check the fore-mentioned project first

The engine oil and filter——change the oil and filter. If the fuel is of more than 1.5% sulfur, and the application content of total alkali value for the oil, and shorten 30 oil change cycle half.

The engine valve clearance——Adjust it when first replace the oil in the new or to have adjusted the engine

Cooling system——Join the cooling fluid additives

Fan and generator belt——Check/adjust

Fan bearing（MPGL）——Lubricate

The maintenance of every 500 hours every day

Check the fore-mentioned project first

The changed air valve engine crankshaft——Clear Up

Hydraulic System——Filter and the Lid

Fuel System——Clear Up/Replace the Filter

Cover and the Gas Fuel Filter——Clear Up

The maintenance of every 1000 hours every day

Check the fore-mentioned project first

Power head’s gear box of oil——replace

The maintenance of every 2000 hours every day

Check the fore-mentioned project firs

The oil of the hydraulic oil tank——Change the oil

Differential and final drive——Change the oil

The engine valve clearance—— Adjust

Crane brake system——Check the filling nitrogen pressure of the accumulator Crane brake system——Check the wear of wet piece

The maintenance of every 3000 hours every day

Check the fore-mentioned project firs

Cooling agent of the cooling system——replace the Cooling agent

For technical changes, there would be no further notice.

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